

BY TED CUSHMAN

Makeup Air for Kitchen Range Hoods

Kitchen ranges are a significant source of indoor air pollution. Gas ranges produce oxides of nitrogen, or NOx, and if they don't combust cleanly, they can produce carbon monoxide too. Both gas and conventional electric ranges interact with smoke, spatter, fumes, and vapors from cooking to produce clouds of small particles that are suspected of having health effects.

The point of kitchen exhaust hoods is to capture those combustion gases, vapors, and particles (along with odors) and send them safely out of the house. But kitchen exhausts—particularly the large units associated with commercial ranges—come with their own set of problems. In particular, they can backdraft other appliances in the house, such as natural-draft heating equipment and water heaters.

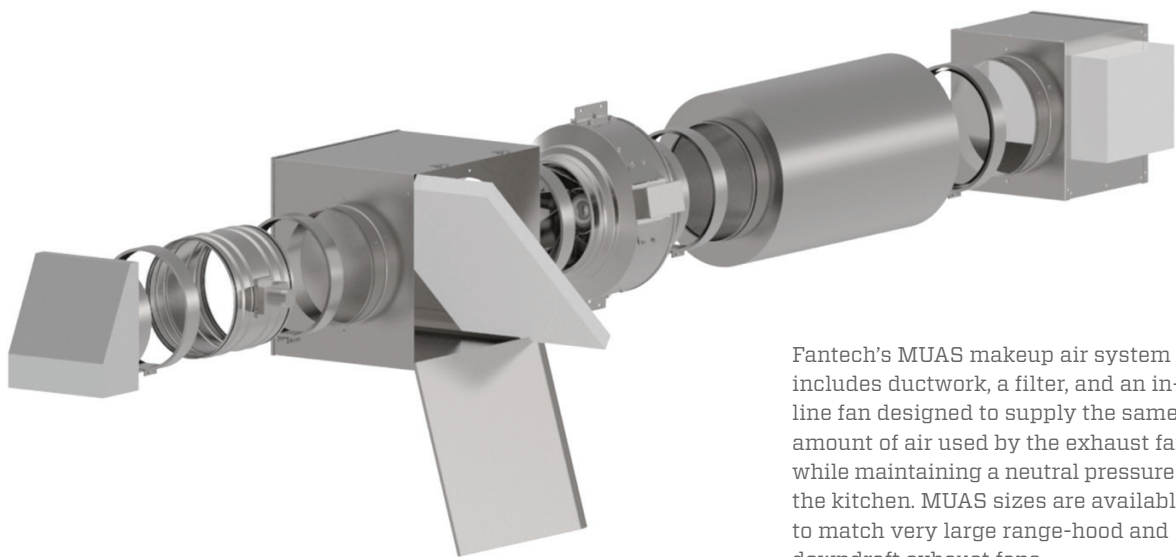
In 2009, the International Residential Code (IRC) was amended to require makeup air to be provided for any kitchen exhaust fan that exceeds 400 cubic feet per minute (cfm) in capacity. That requirement stayed in the code through the 2012 and 2015 editions. Then, in 2018, the code was amended again to limit the application of that makeup air requirement. The new language requires makeup air only if the house also has atmospherically vented combustion equipment that could be backdrafted, such as a naturally vented water heater or a natural-draft furnace. An all-electric house or a

house with only sealed combustion equipment would be exempt from the makeup air requirement. Here's the language:

"Where one or more gas, liquid, or fuel-burning appliance that is neither direct-vent nor uses a mechanical draft venting system is located within a dwelling unit's air barrier, each exhaust system capable of exhausting in excess of 400 cubic feet per minute shall be mechanically or passively provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not fewer than one damper complying with Section M1503.6.2."

Interestingly enough, the IRC has never required kitchen range hoods themselves. The provisions for makeup air are required when a high-capacity exhaust fan is installed, but there is no rule in the model code actually requiring any type of range hood.

That's not to say, however, that a state or local code can't require an exhaust fan, and some do. Oregon's code, for example, provides, "Domestic kitchen cooking appliances shall be equipped with ducted range hoods or down-draft exhaust systems." But Oregon requires only a small fan capacity: 150 cfm intermittent. Washington, by comparison, stipulates, "Exhaust shall be provided in each kitchen, bathroom, water closet, laundry area, indoor swimming pool, spa, and other room where water vapor or cooking odor is produced."



Fantech's MUAS makeup air system includes ductwork, a filter, and an inline fan designed to supply the same amount of air used by the exhaust fan while maintaining a neutral pressure in the kitchen. MUAS sizes are available to match very large range-hood and downdraft exhaust fans.



Broan's makeup air damper opens or closes in response to the control on the range hood fan, allowing passive entry of makeup air for the exhaust fan.

There is no mention of range hoods, and the required ventilation rate, again, is low: 25 cfm continuous, or 100 cfm intermittent.

In any case, large commercial-style gas ranges typically are installed with powerful range hoods and for good reason: Nobody using a big range would want to be without the ability to capture and exhaust smoke, heat, steam, and cooking odors. Once a range hood capable of 600 cfm, 800 cfm, or 1,200 cfm is in place, backdrafting of pressure-sensitive equipment is a risk.

There are other reasons besides backdrafting to consider the need for makeup air. In tight houses, exhaust fans are fighting against room pressures to move air. If there aren't enough leaks in the building envelope to supply makeup air, the fan may not effectively exhaust the kitchen air. In that case, the primary purpose of the fan is frustrated.

There are two kinds of solutions to providing makeup air: active and passive. Typical of the passive solution is the Broan Automatic Makeup Air Damper (see photo, above). The damper comes in three sizes (6 inches, 8 inches, and 10 inches). The idea is for the damper to open any time the exhaust fan is depressurizing the space. Broan offers a variety of control strategies for operating the damper: a "LinkLogic" connection that sends control signals over power wiring, a direct-wired connection that communicates with the exhaust device through low-voltage wiring, and a Universal model that controls the damper by means of a pressure sensor at the exhaust device, connected to the damper via low-voltage wiring.

The Broan solution requires a pressure difference to move air through the makeup air duct. An alternative to this strategy is the Fantech Makeup Air System, or "MUAS" (see photo, facing page). The MUAS incorporates an in-line intake fan to the air supply duct, calibrated to match the kitchen exhaust fan. Like the Broan damper, the Fantech equipment comes in a range of sizes to match various exhaust fan capacities: the MUAS 750, the MUAS 1200, the MUAS 1600, and the MUAS 2000 (the number corresponds to the maximum cfm of the fan). Controls enable the installer to set up the system to operate at a neutral air pressure, a slight positive pressure, or a slight negative pressure. The system responds to the speed of the exhaust fan and ramps the MUAS fan up or down to match the exhaust airflows.

In cold climates, in-drawn air can cause discomfort during winter. To compensate for this, Fantech offers an optional MUAH air heater that tempers the incoming air using electric resistance heat.

Range-hood manufacturers have responded to the code in another way: They've simply provided the market with more hoods whose maximum exhaust airflow is under 400 cfm. The market is now full of range hoods whose maximum airflow is rated at 390 cfm. For most kitchen ranges, that's more than sufficient to get the job done.

So for builders who want to avoid problems, there's a pretty simple pathway: In new construction, stick to ranges that will work well with less than 400 cfm of exhaust; stick to all electric or all sealed-combustion heating and hot-water equipment; and, to minimize the need for kitchen exhaust, consider installing electric convection ovens and electric induction ranges. That combination should give you simple code compliance without makeup air, and reasonably effective performance across the board. The wrinkle, of course, is fireplaces: If you have a fireplace in a house with a powerful range hood, you probably want to include makeup air in your kitchen design.

Remodels, however, are another matter. In many cases, a new kitchen with new cooking and venting equipment is built in a house with existing naturally vented heating equipment, such as a natural-draft water heater. The new range hood could push the water heater into a backdrafting situation. And as the old adage says, "If you don't test, you don't know."

Gary Boyer is a project manager for Edge Energy in the Washington, D.C., suburbs. In his work verifying builder code compliance, Boyer says, it has been at least seven years since he's seen a naturally vented water heater in a new build. On the other hand, he says that in his combustion testing work, it's not uncommon to find a new range hood threatening to backdraft an existing water heater in a remodeling situation. You could handle that problem by installing makeup air for the kitchen. But Boyer says the common solution is to replace the water heater with a direct-vent model.

Ted Cushman is a senior editor at JLC.